

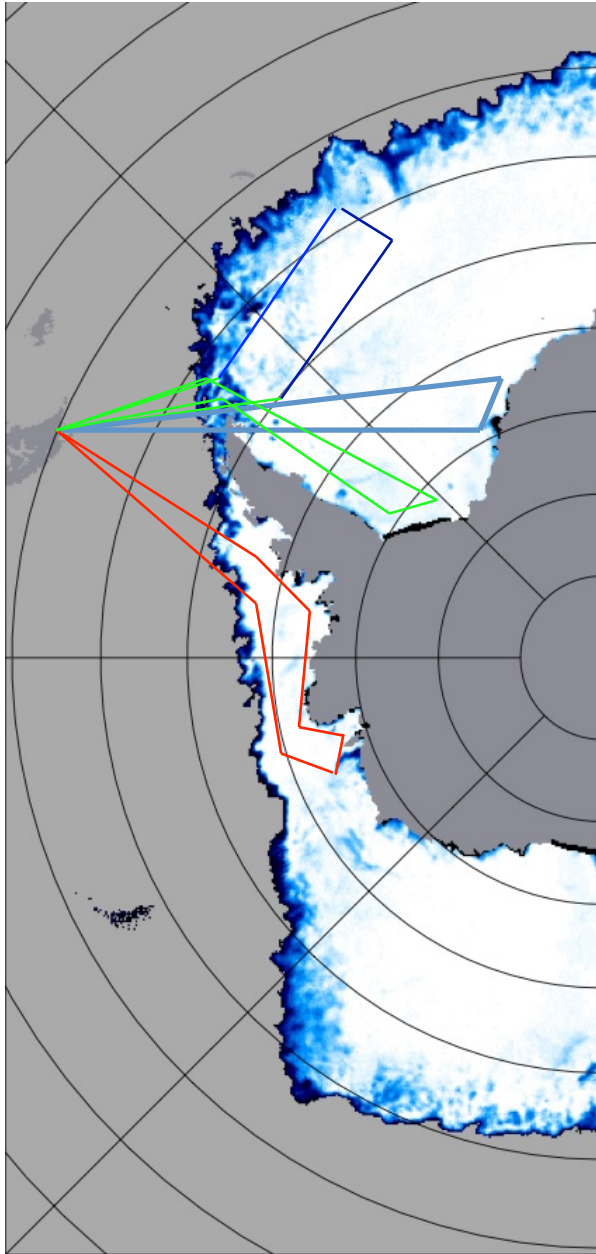


# **IceBridge 2010**

## **Proposed Sea Ice Flightlines: Priorities and Justifications**

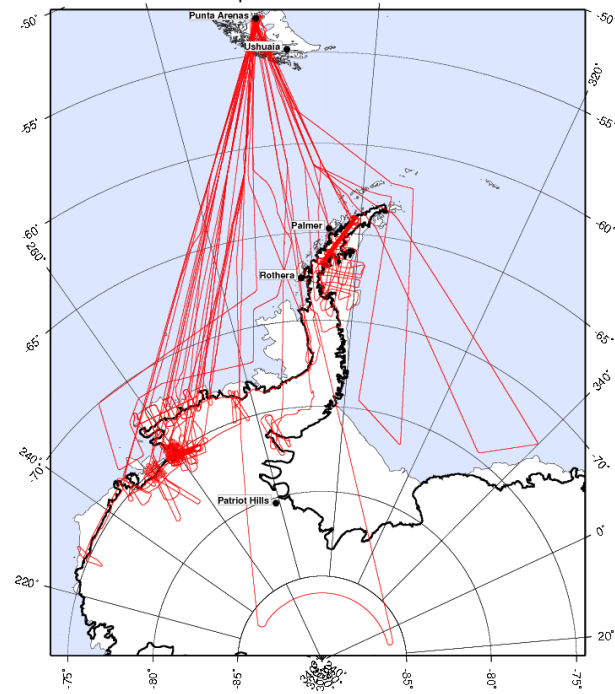
R. Kwok, T. Markus, S. Farrell, D. McAdoo et al.  
Prepared 6/25/10

Priority 1, 2, 3, 4



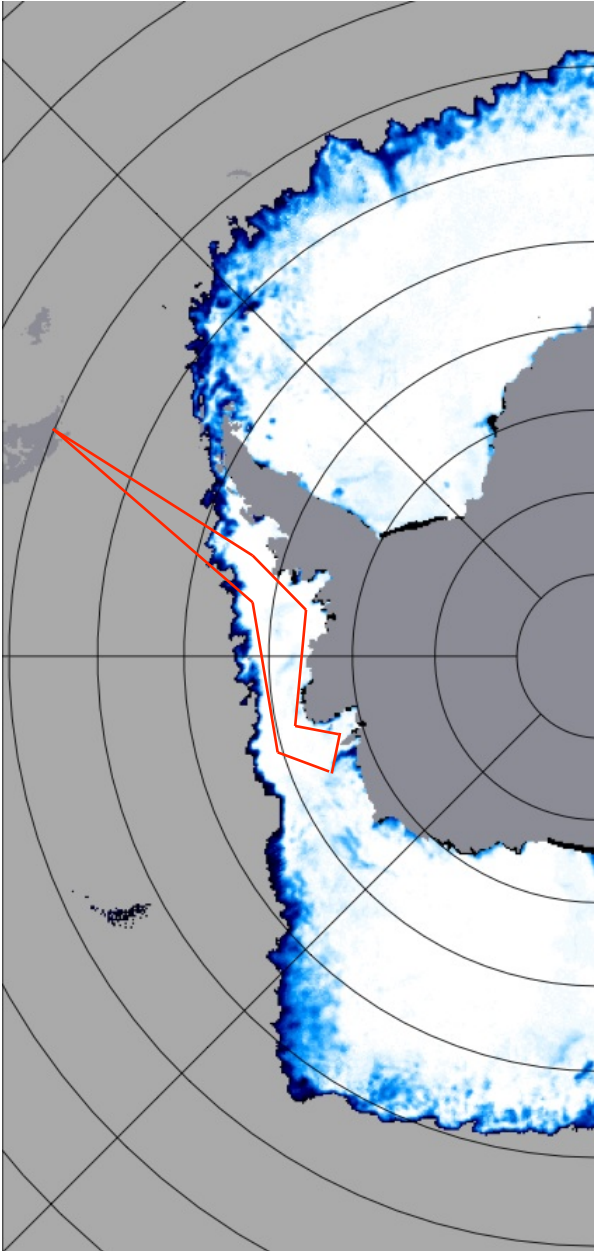
## 2009 Deployment

Fall 2009 IceBridge Missions Flown  
Updated 19 November



# Guidelines and Classification

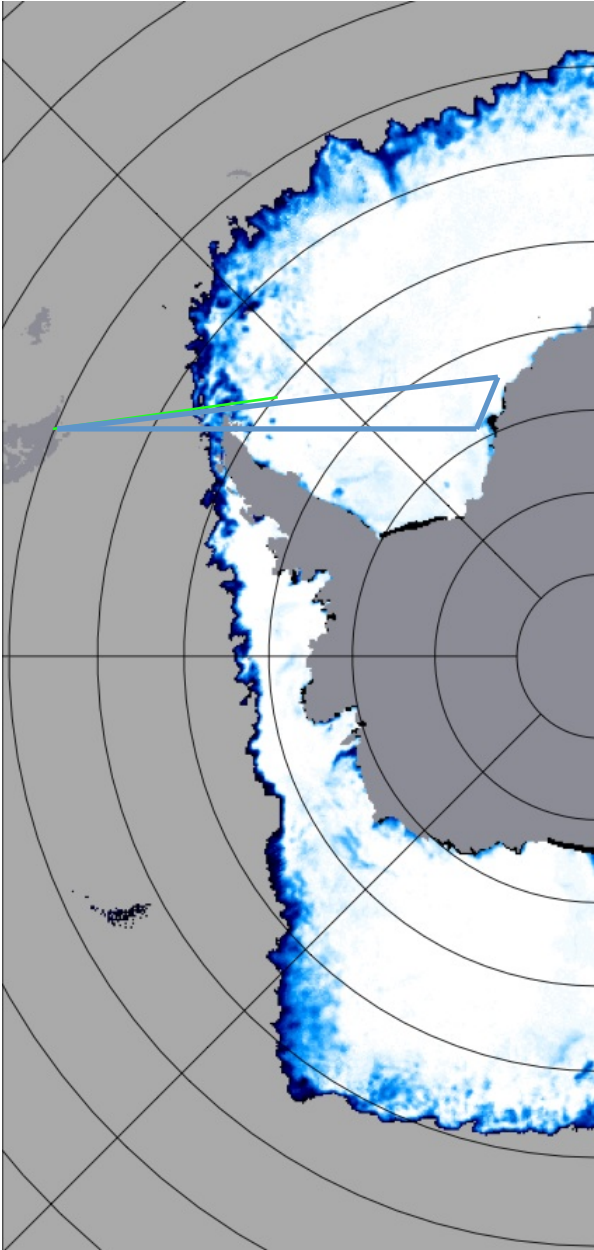
- Guidelines
  - 7 flightlines
- Classification of flightlines (two types)
  - Change detection from 2009 baseline
  - Support of satellite validation and field experiments
    - CryoSat-2 underflight
    - Bellingshausen Sea Ice (ICEBELL) field program



## Sea Ice 01 (Change detection)

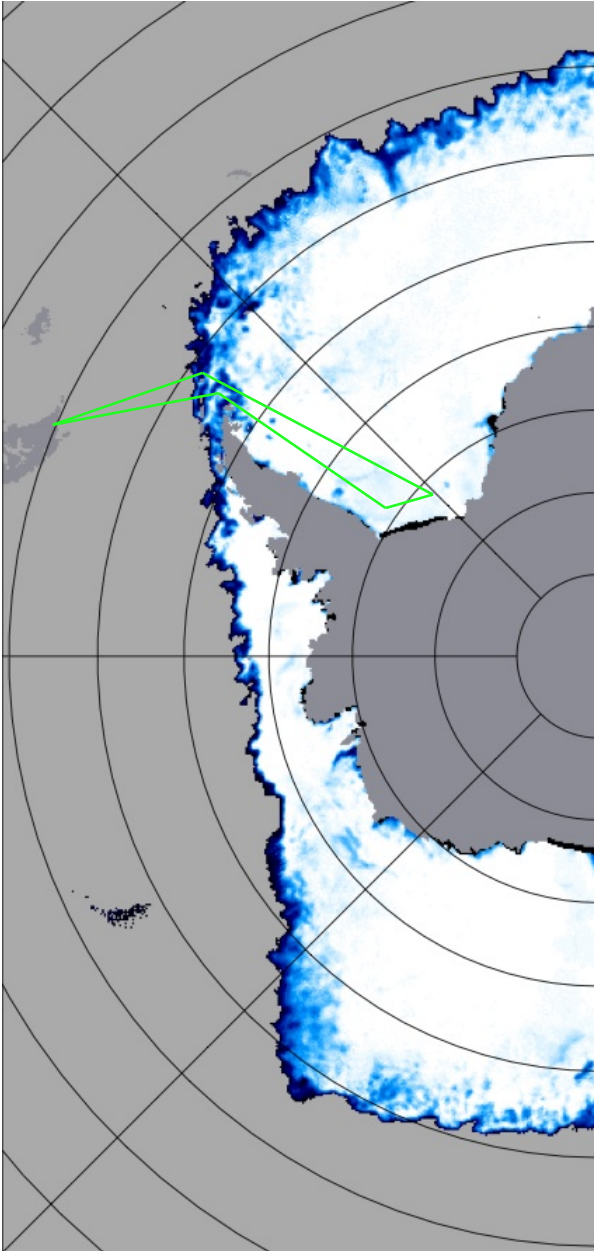
- This is an exact repeat of the Oct 21, 2009 flightline but near ice edge segment subject to location of ice edge
- Science: West of Antarctic Peninsula/Bellingshausen Sea/Pine Island Bay/Thwaites: region with large variability in ice extent that is linked to Southern Oscillation; potential sea ice damping of oceanographic impact (waves) on Pine Is and Thwaites Glaciers, thus conditions close to ice fronts are of interest; for contrasting ice conditions off the east and west coast of the Peninsula.
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: High
- Notes: Based on the surface air temperature plots (see attached), this flightline (Bellingshausen) should be flown as early as possible, preferably before mid-Oct, because of the earlier onset of melt of that area.





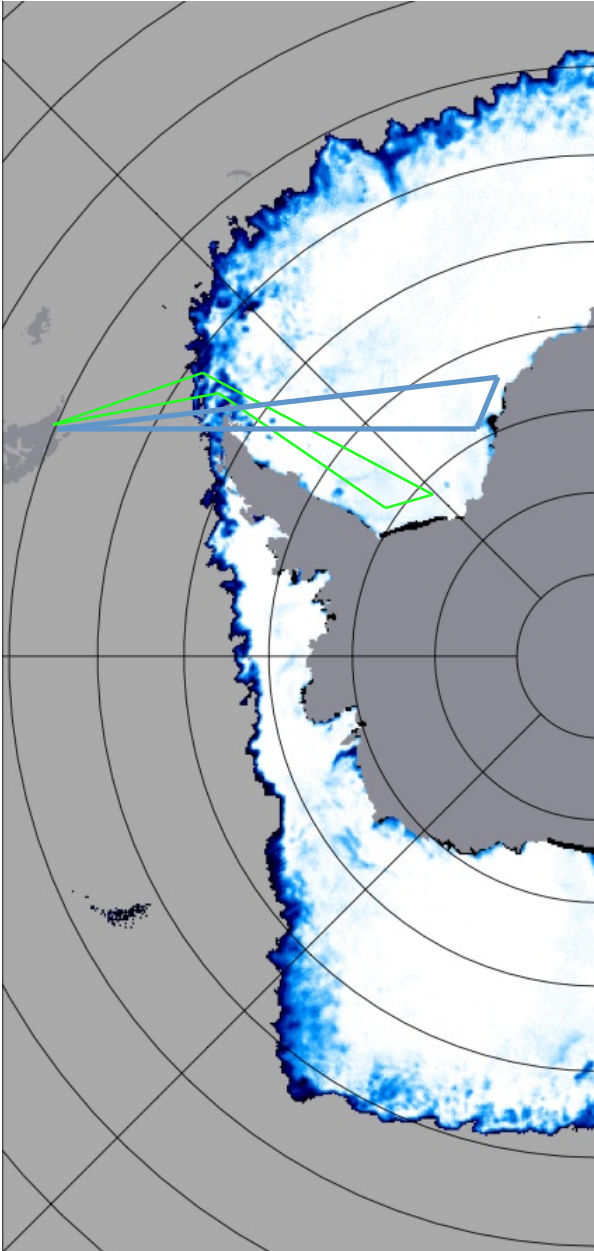
## Sea Ice 02 (Change detection)

- This is an exact repeat of the Oct 30, 2009 flightline
- Science: Weddell Sea Ice mass budget: Ice export (a measure of ice production) from the Weddell is typically computed along a gate from the tip of the Peninsula to Cap Norvegia. This will give us the gradients in freeboard/thickness estimates along the gate. Total volume exported into the Antarctic Circumpolar Current is the inflow from the east together with the ice produced in the polynyas in the south and the ice grown in the Weddell Sea proper.
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: High
- Notes:



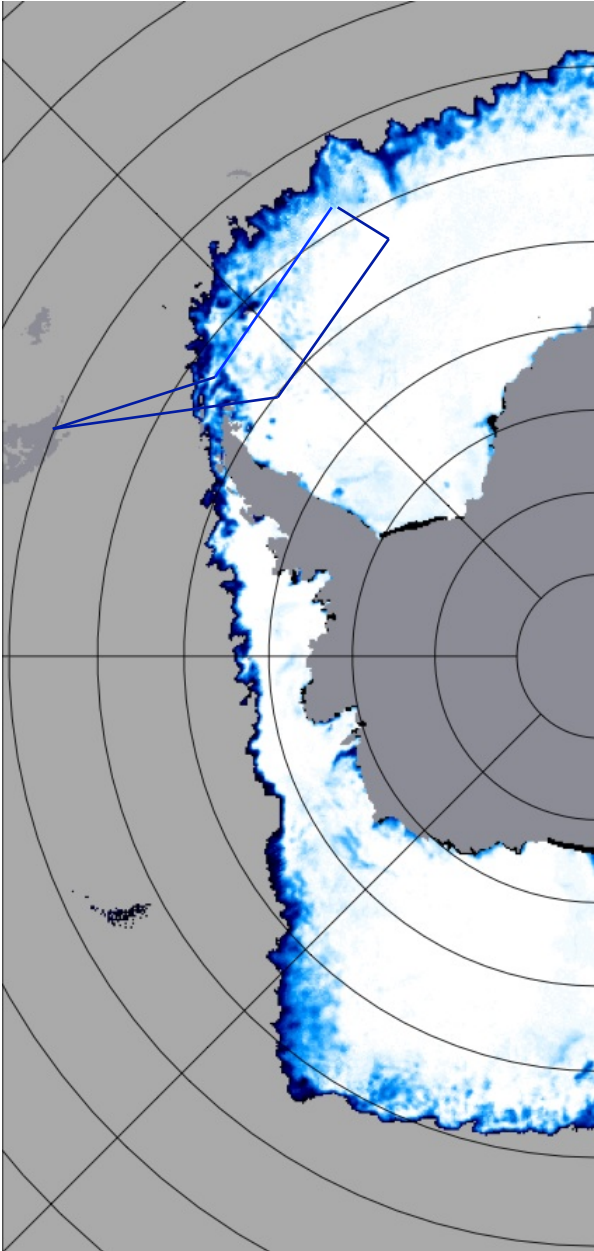
## Sea Ice 03 (Change detection)

- This is an exact repeat of the Oct 24, 2009 flightline
- Science: Weddell Sea old ice/polynya production: sampling of the the oldest ice in the Weddell Sea as well as the thin ice just north of the Ronne Ice Shelf;. for contrasting ice conditions off the east and west coast of the Peninsula. This is important for understanding the oceanography of the Southern Weddell because of the amount of freezing and extended transit time (from south to north) required to form the old ice.
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: High
- Notes:



## Sea Ice 04 (Change detection)

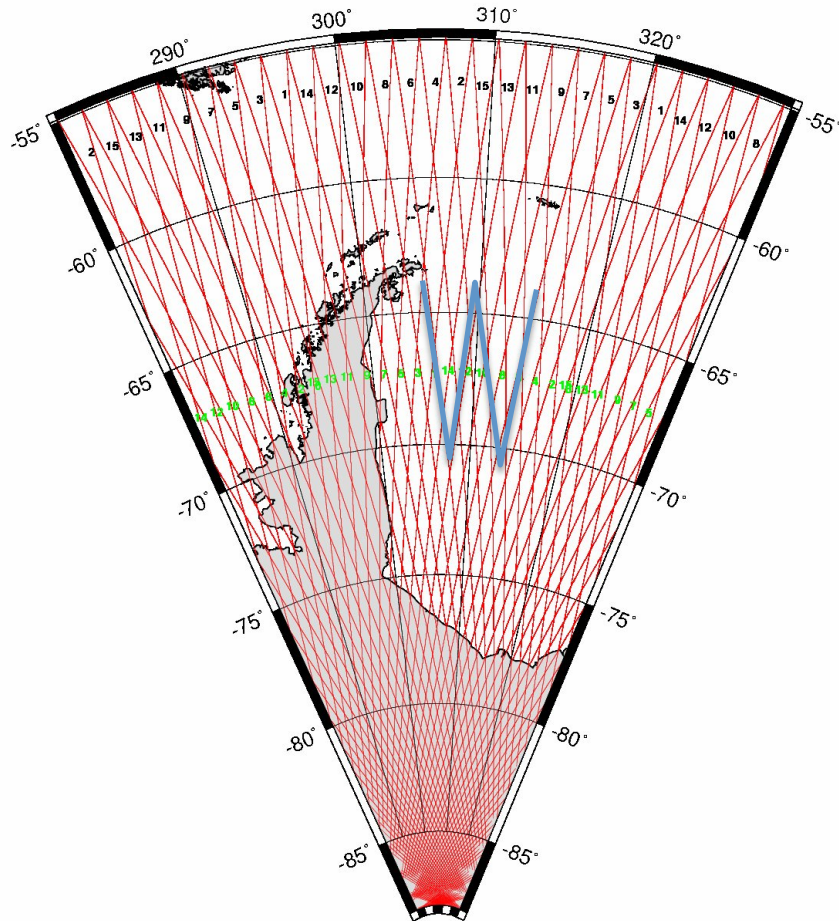
- Re-fly Sea Ice 02 or 03 later in the operation for detection of changes in the snow cover over a 3-4 week interval
- Science: see Sea Ice 03 and 04
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: Medium
- Notes:



## Sea Ice 05

- This is requested line was not flown in 2009. (Note that this was not flown because of heavy low level fog near ice edge in late Oct/early Nov)
- Science: Weddell Sea Ice Margin: general conditions and compactness of ice cover close to the ice margin.
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: Low
- Notes:

15 days of CryoSat-2 Tracks from 30-day subcycle - IceBridge Fall '10 Flights



Groundtracks from a CryoSat simulator (30 day sub-cycle show that on any given day during CS2 should transect (nearly North-South) the Western Weddell somewhere between 300E (the east coast of the Antarctic Peninsula) and 315E. (Provided by D. McAdoo)

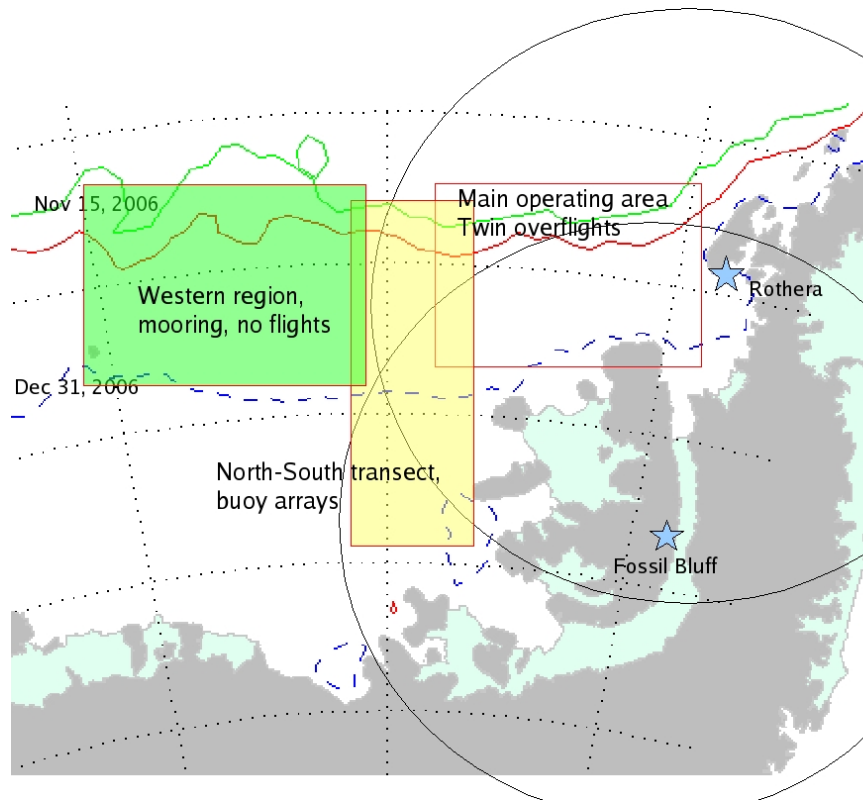
## Sea Ice 06 (CryoSat-2 underflight)

- New flightline (s) (accurate CS2 groundtrack predicts for planning may not be available until end of June)
  - Zig-zags for obtaining near-coincident coverage (1 hr)
  - Maybe flown as one flight or multiple flights
- Science: Validation of SIRAL mode of CryoSat-2; identification of open water for freeboard determination – radar performance and algorithm refinement
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: High
- Notes: prefer to have underflight(s) as early in the campaign as possible before the melt season begins in earnest-- i.e., October; thick/compacted ice Western Weddell Sea (just east of the Antarctic Peninsula) preferred to Bellingshausen/Amundsen Seas (west of the Antarctic Peninsula); Low elevation (500m to 1000m) prefer to use snow radar and ATM as opposed to high altitude (25000 ft +) with LVIS; coincidence in time (within an hour?) and space (<200 m crosstrack) is key; Segments (several hundred km long) of different ascending and descending tracks may be flown



# Sea Ice 07

## (ICEBELL field program)



- This is an exact repeat of the Oct 24, 2009 flightline
- Science: Support of “Sea ice processes and Mass Balance in the Bellinshausen Sea – ICEBell” supported by NERC; detailed 3D characterization of the ice thickness distribution using an AUV, and the characterization of surface freeboard and snow depth with both an in situ measurement campaign and lidar surveys from a BAS Twin Otter.
- Instruments: ATM, Snow Radar, Gravimeter, altimeter
- Flight Priority: High
- Notes:

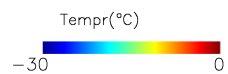
# General Comments

- Opportunities for high altitude LVIS mapping
  - Transit flights to map ice sheet
- Others (added after splinter)

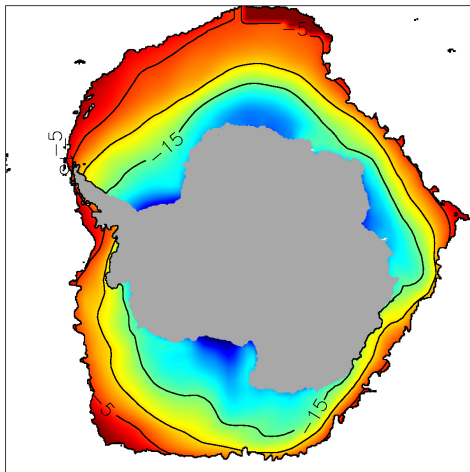
Backup



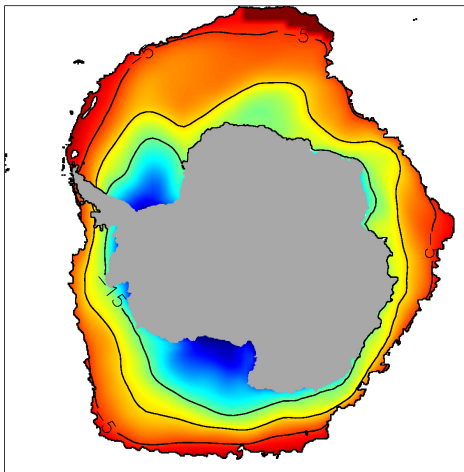
# ECMWF Temperature



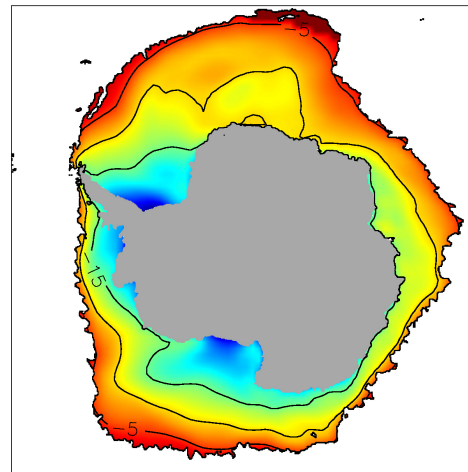
071001 - 071006



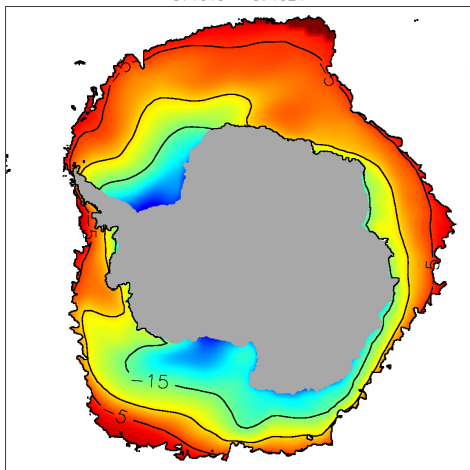
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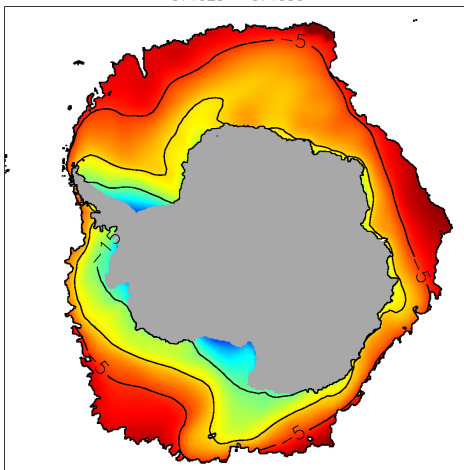
071013 - 071018



071019 - 071024

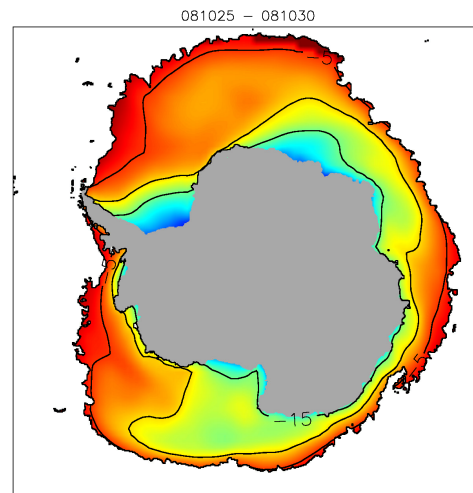
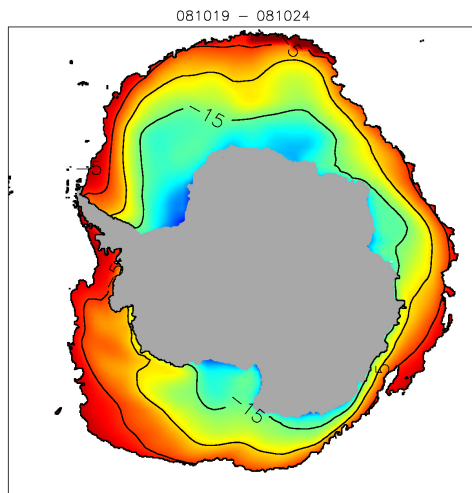
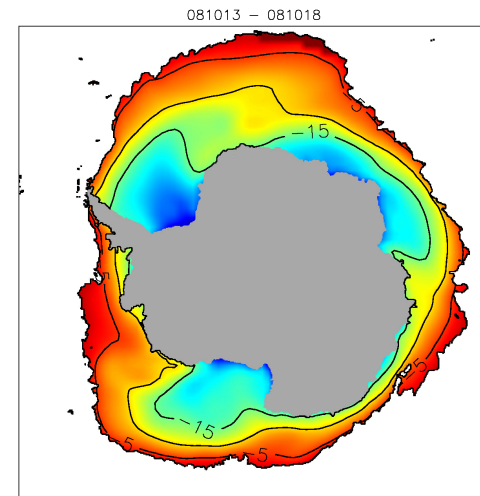
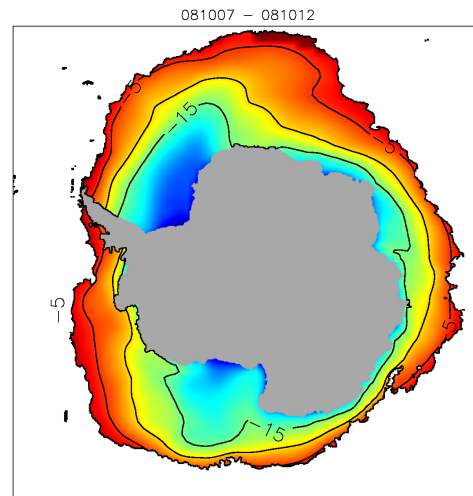
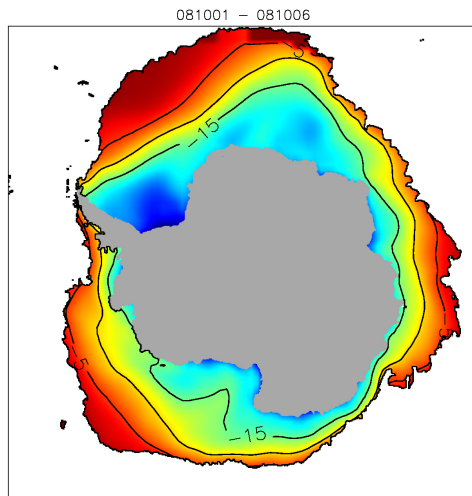
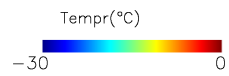


071025 - 071030



Mean 6-day surface air  
temp in Oct 2007  
(contour interval: 5 deg)

# ECMWF Temperature



Mean 6-day surface air  
temp in Oct 2008  
(contour interval: 5 deg)